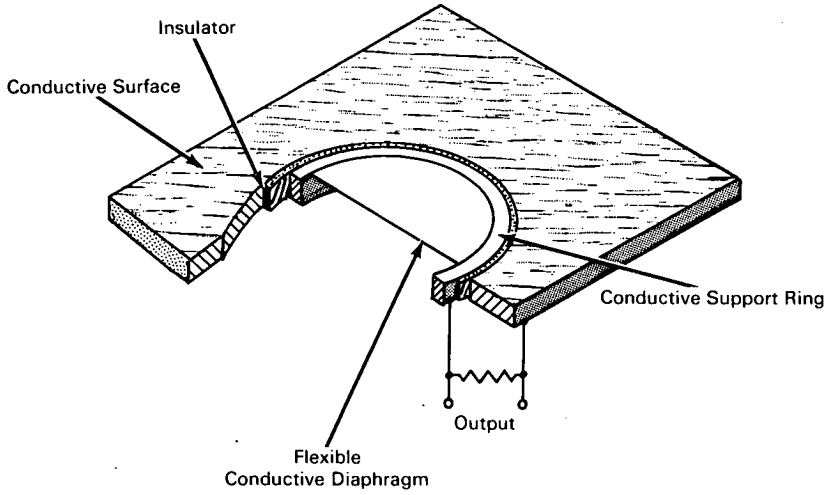
NASA TECH BRIEF

Vibrating Diaphragm Measures High Electrostatic Field Strengths



The problem: To provide an improved device for the measurement of electrostatic field strength or charge density on a conducting surface in a vacuum. Devices employing a rotating plate (the electric field mill) or a vibrating disk for the electrical measurements present problems with respect to brush design, vacuum sealing, lubrication of moving parts, and the reliability of flexibile conducting wires. These devices also cannot be used for measurement of high charge densities in vacuum because of field emission or corona from the edges of the plates or disks.

The solution: A meter incorporating a flexible conductive diaphragm that is supported from an insulated conductive support ring rigidly attached to the conductive surface whose electrostatic charge density is to be measured.

How it's done: A fixed resistor is connected between the conductive support ring and the conductive surface. In its equilibrium position, the diaphragm is flush with the conductive surface. When the diaphragm is vibrated about its equilibrium position by a suitable means (not illustrated), the charge density on its surface will vary at a rate determined by the vibration frequency. As a result of this variation, an alternating current proportional to the electrostatic field strength (or charge density) will flow in the resistor. The voltage across this resistor may be used as the output signal.

Notes:

1. This simple, stable, and rugged meter can be used in pressurized as well as in vacuum environments. It would be particularly useful for measuring high field strengths on a conductive surface in vacuum because corona and field emission are minimized.
2. The diaphragm can be driven (with relatively little power) at high frequencies to provide increased sensitivity.

(continued overleaf)

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Manned Spacecraft Center
P.O. Box 1537
Houston, Texas, 77001
Reference: B65-10352

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Electro-Optical Systems, Inc.
under contract to Manned Spacecraft
Center
(MSC-189)